CLAIMS

1. A local environmental cell for a welding spray gun, comprising:

an annular ring having a top surface and a bottom surface, wherein the annular ring is adapted for attachment to an outer perimeter of the spray gun; and

a plurality of fluid passageways radially disposed about the annular ring comprising a plurality of openings in the bottom surface of the ring in fluid communication with a vacuum source for providing a vacuum thereto.

2. The local environmental cell of Claim 1, wherein the plurality of fluid passageways comprises a plurality of tubes having one end in fluid communication with an annular passageway contained in the annular ring and an other end in fluid communication with the vacuum, wherein each one of the tubes is uniformly spaced apart about a perimeter of the annular ring.

3. The local environmental cell of Claim 1, wherein the plurality of fluid passageways comprises a plurality of tubes having one end in fluid communication with at least one passageway extending through the annular ring to the opening in the bottom surface and the other end in fluid communication with the vacuum.

4. The local environmental cell of Claim 1, wherein the spray gun is a plasma transferred arc torch.

5. In combination, a welding gun and a local environmental cell, the combination comprising:

a welding gun including a permanent electrode disposed within a housing, wherein the housing includes fluid passageways for passage of an inert gas; and

a local environmental cell attached to an outer perimeter of the welding gun, the local environmental cell comprising an annular ring circumscribing the welding gun housing and having a top surface and a bottom surface, wherein the annular ring further comprises a plurality of fluid passageways radially disposed about the annular ring having a plurality of openings in the bottom surface of the ring in fluid communication with a vacuum source for providing a vacuum thereto.

6. The combination of Claim 5, wherein the welding gun is a plasma transferred arc torch.

7. The combination of Claim 5, wherein the outer perimeter of the housing is threaded and the inner perimeter of the annular ring has complementary threads.

8. The combination of Claim 5, wherein the plurality of fluid passageways of the local environmental cell comprises a plurality of tubes having one end in fluid communication with an annular passageway contained in the annular ring and an other end in fluid communication with the vacuum, wherein each one of the tubes is uniformly spaced apart about a perimeter of the annular ring.

9. The combination of Claim 5, wherein the plurality of fluid passageways of the local environmental cell comprises a plurality of tubes having one end in fluid communication with at least one passageway extending through the annular ring to the opening in the bottom surface and the other end in fluid communication with the vacuum.

10. A process for welding a substrate and forming a low oxide bond coat during the welding process, the process comprising:

circumferentially maintaining an inert atmosphere about an area of the substrate to be welded, wherein maintaining the inert atmosphere comprises circumferentially vacuuming about the plasma arc with a local environmental cell;

welding the substrate and forming a molten pool in the area of the substrate, wherein the molten pool has a trailing edge and a leading edge; and

selectively depositing a powder at the trailing edge as the molten pool is solidifying or prior to solidifying in an amount effective to form a bond coat layer on the substrate.

11. The process according to Claim 10, wherein forming the molten pool comprises forming plasma in a plasma transferred arc tool and exposing a portion of the substrate area to the plasma.

12. The process according to Claim 10, further comprising depositing a thermal barrier coating on the bond coat in a thermal spray process.

13. The process according to Claim 11, wherein forming the plasma in the plasma transferred arc tool comprises forming an arc between an electrode in the plasma transferred arc tool and the substrate, and flowing an inert gas through the arc.

14. The process according to Claim 11, wherein the bond coat comprises MCrAlY, wherein M is selected from the group consisting of Fe, Ni, Co, and a mixture of Ni and Co.

15. The process according to Claim 11, wherein the bond coat comprises a diffusion aluminide.

16. A turbine component repaired and bond coated in accordance with the process of Claim 10.

17. A process for forming a low oxide bond coating, comprising

forming a plasma arc atop a substrate;

circumferentially vacuuming an area about the plasma arc with a local environmental cell, wherein the local environmental cell comprises an annular ring engaged with an outer perimeter of a plasma spray gun for forming the plasma arc, the annular ring comprising a plurality of fluid passageways having openings positioned above the substrate so as to vacuum particulates, non-reacted powder, ozone, and fumes from the substrate; and

delivering a powder in a carrier gas to the workpiece to produce the bond coating.

18. The process according to Claim 17, wherein forming a plasma arc atop comprises forming an arc between an electrode in a plasma transferred arc nozzle and the substrate, and flowing an inert gas through the arc.

19. The process according to Claim 17, wherein the carrier gas comprises argon, helium, nitrogen, and combinations thereof.

20. The process according to Claim 17, wherein bond coating comprises depositing MCrAlY, wherein M is selected from the group consisting of Fe, Ni, Co, and a mixture of Ni and Co.

21. The process according to Claim 17, wherein bond coating comprises depositing a diffusion aluminide.